Clay mineralogy and chemical environment of an Aptian lacustrine succession in North-Eastern Brazil

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The studied core was drilled in the Jatobá Basin, which is underlain and surrounded by the crystalline basement of the Borborema Province (NE Brazil).

113 samples were analysed by X-ray diffractometry, 17 of which were selected for clay mineral analysis. Sandstones were also studied by polarising microscopy and scanning electron microscopy.

Petrographically, 5 lithotypes can be defined: (1) generally silty grey shales, (2) grey marly shales to shaly marls, (3) generally fine-grained, argilaceous sandstones (4) micritic limestones, occasionally with a minor content of dolomite, (5) dolostone (dolomite > calcite).

In many of the shales, expandable clay minerals are dominant among the clay mineral suite (predominantly illite-smectite), followed by illite, kaolinite and chlorite.

In contrast to the shales, sandstones can contain considerable amounts of smectite, besides illite and minor proportions of kaolinite and chlorite. Quartz and feldspars are usually main components. Calcite is sometimes present. Some of the sandstones show high contents of unweathered biotite, often marking sedimentary structures like ripple crossbedding as dark layers.

The presence of chlorite and biotite as clastic components, indicate mild regional weathering, and/or fast erosion and transport to the lacustrine basin. Smectite occurring in the sandstones indicates volcanic activity.

The ocurrence of dolomite is uncommon for lacustrine freshwater environments. Freshwater conditions are indicated by oxygen isotopes [1] and ostracods. The occurrence of dolomite together with high organic matter content and intensive bacterial activity may explain lacustrine dolomite formation without evaporitic conditions.

[1] Gratzer *et al*. (2011) Stable isotopes of organics & inorganics of Aptian lacustrine sediments in northeastern Brazil. This volume.

Constraining subannual variability in river chemistry and hydrology with $^{87}Sr/^{86}Sr$: A case study in the Fraser River basin, Canada

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River systems present a significant challenge to quantification of global elemental fluxes among atmospheric, terrestrial, and marine reservoirs, as aquatic passageways exhibit complex processing and storage of material on timescales driven by local and distant climatic and geophysical cycles [1-3]. The Fraser River basin in southwestern Canada has three important features making it ideal for testing geochemical approaches to tackling these issues: 1) its moderate size and temperate climate are neither exceptional nor insignificant among global rivers; 2) a spectacular diversity of bedrock geology and vegetation allow for discrimination of sources of transported material; and 3) its modest industrial footprint allows for assessment of relatively unperturbed processes. Three recent field campaigns at low, medium, and high water flow have generated a broad dataset of informative geochemical parameters. Dissolved $^{87}Sr/^{86}Sr$ signatures of major tributaries and daily discharge data form the backbone of a preliminary attempt to model the geochemical variability of exported material across the hydrograph. Over one full year of time series sampling near the Fraser mouth has demonstrated that subannual variability in dissolved $^{87}Sr/^{86}Sr$ is significant and mirrors temporal and spatial changes in the hydrology of the basin. Extending this approach to other elemental fluxes of interest and other river basins will vastly improve global biogeochemical budgets and the potential to predict future changes.

[1] Aufdenkampe *et al*. (2011) *Front Ecol Environ* **9**(1), 53–60. [2] Rossi *et al*. (2009) *J Hydrol* **377**, 237–244. [3] Milliman & Syvitski (1992) *J Geol* **100**, 525–544.